GLOBE Measurements in Time and Space

We live on a changing planet. Moment by moment, day to day, year after year change is all around us. Some changes are cycles such as the day, the variations in the tides as the moon orbits the Earth, and the yearly change of seasons. Other changes seem to come and go such as clouds and rain storms. Still other, gradual change we see as growth such as with trees or other plants or even ourselves. Sometimes big changes happen quickly as when a volcano erupts or a fire sweeps over the land. Each type of change happens on its own time scale.

All of us, especially scientists, want to understand the changes happening all around us. Why do changes happen; how do different changes influence each other; what will happen next? To understand change, and in some cases predict it, we must measure our environment, but we can't measure everything happening in our environment, everywhere, all the time. Instead we try to make measurements in a way which will give us enough data to tell what is happening.

In GLOBE, the atmospheric measurements are designed to be made once each day while streams, rivers, lakes, bays, the ocean, or ponds are measured weekly, and soil characteristics in a given place need only be measured once. Other measurements are taken at different intervals. Some measurements are snap shots - what types of clouds do we see right now? Some measurements tell us what has happened over a period of time - how much rain fell in the last day? The time scale on which we make the measurements allows us to analyze the different changes in our environment.

Our environment also varies from place to place. We live on mountains, valleys, plains, coasts. We live in cities, suburbs, villages, and the country side. In some places grasslands, fields or forests surround us for as far as we can see. In other places, a mountain may rise next to our town or there may be forests, fields, and lakes all mixed together. On a finer scale, in one place there is a tree or a grass, in another a road, in another a house, and in another a stream. Sometimes we can see that it is raining near-by but not where we are. Clearly, our environment varies on different distance scales.

Again, we cannot measure everything about our environment everywhere. So we space our observations so as to measure the variations on their different spatial scales. In GLOBE, each school is at the center of a GLOBE Study Site which is a square 15 km on a side. These sites can overlap or be shared among schools. In GLOBE, students learn how to determine the land

cover of this whole site looking at variations down to a spatial scale of 30 meters. Within this overall site, students at a GLOBE school make recurring measurements at specific locations known as *study sites*. Other measurements are made only once at a number of *sample sites.* As the number of GLOBE schools increases, more of our global environment is covered by good measurements and variations over smaller distances can be studied.

With all the changes in our environment over time and variations over space, our ability to understand our environment is limited by the number of measurements we can make. Each GLOBE school has the opportunity to add significantly to the total set of measurements being made around the world. As we keep making GLOBE measurements carefully and consistently, we are giving ourselves and everyone else a gift of better knowledge of our environment both locally and globally.